Remarks

Prior to this Amendment, Claims 1-14 are pending and under consideration. With this Amendment, new Claim 15 is added. Therefore, after entry of this Amendment, Claims 1-15 are pending and under consideration.

New Claim 15 is added to recite one embodiment of the invention that the gas flow divider comprises a disk having a single central orifice forming the first gas flow path. Support for this new claim can be found, for example, in the Specification at page 20 and Figures 12a-12b showing a single central orifice.

In the response filed December 8, 2003 to the Office Action mailed August 13, 2003, Applicant amended the Claims and presented remarks on the cited references in light of the claim amendment. In particular, independent Claims 1 and 11 were amended to incorporate a limitation of "*the inner tube extends a distance at least encompassing the arrays of orifices in the outer tube, ... wherein the gas flow divider divides a gas into a first gas flow into the inner tube and a second gas flow into the annual space, the first gas flow travels out of the outlet end of the inner tube and into the annular space.*" (emphasis added)

In this Office Action, the Examiner agrees that Kawakami does not teach an elongated inner tube that extends a distance at least encompassing arrays of orifices in an elongated outer tube. See pages 3 and 8 of the Action. However, the Examiner states that "it would have been obvious to one of ordinary skill in that art at the time the invention was made to ... including dimensioning Soichiro Kawakami's gas delivering metering tube and inner tube wherein the cross sectional area of the inside of the elongated inner tube (5) is approximately equal to the total cross sectional area of the plurality of small orifices (15) in the flow divider. Motivation ... to dimension Soichiro Kawakami's gas delivery metering tube and inner tube wherein the cross sectional area of the inside of the elongated inner tube is approximately equal to the total cross sectional area of the plurality of small orifices in the flow divider is to provide for the desired pressure gradient. Further, it is well established that changes in apparatus dimentions are within the level of ordinary skill in the art." See page 8 of the Action. Applicant traverses.

The limitation incorporated into independent Claims 1 and 5 is the elongated inner tube extends a distance at least encompassing the arrays of orifices in the elongated outer tube. However, the Examiner provides comments only on the cross sectional area of the inside of the

elongated inner tube and the total cross sectional area of the plurality of small orifices in the flow divider, a limitation that is recited in dependent Claim 4. In this Office Action, the Examiner does not provide comments on the limitation incorporated into Claims 1 and 11 except that, the Examiner agrees that Kawakami does not teach this limitation as stated at pages 3 and 8 of the Office Action. Therefore, the Examiner has not established a prima facie case of obviousness on independent Claims 1 and 11 under MPEP 2143, which requires, among others, that the prior art reference or references when combined, must teach or suggest all the claim limitations.

Further, the limitation incorporated in Claims 1 and 11 is not a mere change of apparatus dimension as asserted by the Examiner. This limitation is one of the distinctive features of the gas delivery metering tube of the present invention. By this design, the gas flow divided into the inner tube travels out of the outlet end of the inner tube, returns to the annular space, and then exit the orifices in the outer tube. Thus, the present invention provides a gas delivery tube that delivers gases at opposite ends of the tube *using only a single gas inlet at only one end of the tube*. As illustrated in FIGS. 11-14 of the invention, gas is supplied by a single gas supply port and conveyed through a gas flow divider. The gas flow divider splits the gas between the first flow path provided by the center orifice and the second flow path provided by the plurality of small orifices. Gas that is divided by the center orifice enters the inner tube, and the gas divided by the plurality of small orifices enters the annular space. Because the inner tube has no orifices along its length, the gas exits the inner tube at its outlet end, and enters the annual space at the end opposite of the inlet end. In other words, gas from the inner tube enters the annular space at the opposite end of the inner tube where gas enters the annular space through plurality of orifices in the outer tube. Thus, gas is conveyed to both ends of the gas delivery metering tube, while employing *a single gas supply port connected to only one end of the gas delivery metering tube.* The limitation that "the inner tube extends a distance at least encompassing the arrays of orifices in the outer tube" is incorporated into Claims 1 and 11 to recite this feature of delivering gases at opposite ends within the metering tube while using only a single gas inlet at only one end of the tube.

Moreover, Applicant disagrees with the Examiner's application of the law that "changes in apparatus dimensions are within the level of ordinary skill in the art" in the present case involving cross sectional areas of the center orifice and the plurality of small orifices in the gas flow divider as recited in dependent Claim 4. Claim 4 does not recite or claim any specific

dimension of the orifices of gas flow divider. Claim 4 recites one embodiment of the invention where the cross sectional area of the inside of the inner tube is approximately *equal to* the total cross sectional area of the plurality of small orifices in the flow divider, *irrespective of specific dimensions of the inner tube or small orifices in the flow divider,* which are provided in the Specification. By keeping the cross sectional areas of these two paths about equal, approximately equal volumetric gas flow rates are provided in the two gas flow paths.

Regarding FIG. 4 of the Ohashi reference, the Examiner indicates that Applicant mischaracterizes the Examiner's rejection in view of Ohashi. Applicant respectfully submits that Ohashi does not teach a fluid flow divider (*upper portion of 41, Figure 4*) *that divides a gas from a single gas supply port* into a first gas flow via a first gas flow path and a second gas flow via a second flow path. Ohashi teaches an upper portion that is divided by a partition plate 18 into a periphery space area Sx and a center space area Sz. The space area Sx and the space area Sz are *separately* provided with gas supply ports 16 and a gas supply port 19 respectively. The gas supply ports 16 and the gas supply port 19 are *separately* connected to *different gas supply systems Gx and Gz respectively*. Therefore, the upper portion of Figure 4 is used to introduce gases from different sources at different predetermined flow rates into the center portion Z area and the periphery portion X area in the reactor 41. The upper portion of Figure 4 is different from the gas flow divider recited in present Claims 1 and 11, which divides a gas from a single gas supply port into a first gas flow via a first gas flow path and a second gas flow via a second flow path. In Ohashi, the partition 18 completely separates the space area Sx from space area Sz, thus a gas from source Gx or a gas from source Gz flows into a chamber at a predetermined flow rate, respectively. In other words, the upper portion does not *divide* a gas into a first gas flow and a second gas flow, as provided by the gas flow divider recited in Claims 1 and 11.

Furthermore, Ohashi does not teach or suggest a gas flow divider that has a *single* central orifice forming the first gas flow path, as recited in newly added Claim 15. Ohashi teaches a plurality of small holes in the straightening vane 17, as illustrated in Figure 2 and 3.

In the Office Action, the Examiner states that "there is teaching, suggestion and motivation to replace Kawakami's support plate (4) with Ohashi's fluid flow divider. In particular, *both references are geometrically similar and are concerned with the gas flow velocity in the radial direction (normal to the axis of symmetric of both cylinders).*" (emphasis added) Applicant disagrees. The apparatus taught by the two references are not geometrically

similar. Ohashi teaches a *gas flow pattern that is in parallel to the axis of the cylinder*, while in Kawakami, multiple short cylindrical partitions 2 and 3 are used in an effort to distribute a reaction gas from pipe 5 to a reaction chamber in a direction *normal to the axis of the gas supply pipe*. Applicant submits that Kawakami and Ohashi cannot be successfully combined. Ohashi teaches a straightening vane, or a part of a reaction chamber, disposed at *the upper portion of a reaction chamber* for introducing gases from different sources into a reaction chamber at different predetermined flow rates. The vane is designed to impart a flow velocity profile of gases, but not to divide a gas into two portions for the purpose of balancing flow in a mixing region. On the other hand, Kawakami teaches a *cathode* disposed within a reaction chamber. The cathode system of Kawakami for improving the overall uniformity of gas flow exiting the cathode is based on *successive arrays of short cylindrical volumes* coupled to arrays of passages (holes in the partitions) to further volumes and passages. The successive arrays of passages are more numerous, smaller, and not aligned between adjacent arrays. A basic problem in fluid flow arises in changing the nature of the flow from a point source type of inlet to a broader area or a line source in the case of a linear injector. This is typically accomplished by implementing a scheme of successive volumes coupled to finer and finer arrays of outlets as described in Kawakami. Modifying this method, as suggested by the Examiner, by incorporating a straightening vane of Ohashi to essentially short circuit some of the gas flow into the cathode assembly, not only does not appear to be an obvious improvement to Kawakami, but would also appear to modify the cathode assembly in a manner that is inconsistent with its intended purpose.

In view of the foregoing, it is respectfully submitted that this application is now in condition for allowance. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned attorney at the telephone number listed below. The Commissioner is hereby authorized to charge any other fees determined to be due to Deposit Account 50-2319 (Order No. A-67178-1/MSS/TJH).

Respectfully submitted,

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